

CLAIMS

1. A method of efficiently storing an effective address (EA) in an effective to real address translation (ERAT) table supporting multiple page sizes, the method comprising the steps  
5 of:

adding page size indicator (PSI) fields, based on the number of unique page sizes supported, to each ERAT entry;

storing an EA using one ERAT entry; and

10 setting the PSI fields of the ERAT entry to indicate the page size.

2. The method of Claim 1 wherein a PSI field is added for each unique page size, including the base page size.

15 3. The method of Claim 2, wherein the PSI fields are used to indicate that the ERAT entry for a translation-disabled address does not need translation.

20 4. The method of Claim 3, wherein all translation-disabled addresses that have the same state bits and the same EA share the same ERAT entry.

25 5. The method of Claim 1, wherein a PSI field is added for each unique page size, but not for the base page size.

6. The method of Claim 5, wherein a translation-disabled indicator (TDI) is used to indicate that the ERAT entry for a translation-disabled address does not need translation.

30 7. The method of Claim 6, wherein a translation-disabled address is not stored in the ERAT.

8. The method of Claim 1, wherein the effective address (EA) is translated to a real address (RA) using the ERAT table.

9. The method of Claim 8, further comprising:

5       dividing the EA into ranges, based on the number of page sizes supported;

          comparing the EA to each entry in the ERAT;

          determining whether the EA is translation-disabled;

10       upon determining the EA is translation-disabled, outputting the EA as the RA;

          upon determining the EA is not translation-disabled, determining which EA ranges should match, in order for the EA to match the ERAT entry, by checking the PSI fields for each ERAT entry;

15       upon determining which ranges should match, determining if there is a match by comparing the appropriate ranges of the EA and the ERAT entry;

20       upon determining the EA matches an ERAT entry, looking up a corresponding data array address (DAA) in a data array (DA) table;

          using the PSI fields to determine which ranges from the EA and which ranges from the DAA should be used for the RA; and

          outputting the appropriate ranges from the EA and DAA as the RA.

25       10. The method of Claim 1, wherein the EA is written to the ERAT entry by determining whether the EA is translation-disabled.

30       11. The method of Claim 10 wherein, upon determining the EA is not translation-disabled, the method further comprises:

          determining the page size of the EA;

          upon determining the page size, setting the appropriate PSI fields for the entry to indicate the page size;

setting the EA field in the entry to the value of the EA provided; and  
writing the entry.

5        12. The method of Claim 10, wherein upon determining the EA is translation-disabled, the method further comprises:  
determining whether the EA matches an existing ERAT entry;  
and

10        upon determining the EA matches an existing ERAT entry, the existing ERAT entry is used for the EA and a new entry is not written.

15        13. The method of Claim 1, wherein the ERAT entry is invalidated.

14. The method of Claim 13, further comprising:  
means for dividing the EA into ranges based upon how many page sizes are supported;  
means for comparing the EA to each entry in the ERAT;  
20        means for determining which EA ranges should match in order for the EA to match the ERAT entry by checking the PSI fields for each ERAT entry; and  
upon determining the EA matches an ERAT entry, means for setting an invalid indicator field in the ERAT entry.

25        15. An apparatus for efficiently storing an effective address (EA) in an effective to real address translation (ERAT) table supporting multiple page sizes, the apparatus comprising:  
means for adding page size indicator (PSI) fields, based on  
30        the number of unique page sizes supported, to each ERAT entry;  
means for storing an EA using one ERAT entry; and  
means for setting the PSI fields of the ERAT entry to indicate the page size.

16. The apparatus of Claim 15, wherein the EA is translated to a real address (RA) using the ERAT table;

- 5        17. The apparatus of Claim 16, further comprising:  
      means for dividing the EA into ranges, based on the number  
of page sizes supported;  
      means for comparing the EA to each entry in the ERAT;  
      means for determining whether the EA is translation-  
10 disabled;  
      upon determining the EA is translation-disabled, means for  
outputting the EA as the RA;  
      upon determining the EA is not translation-disabled, means  
for determining which EA ranges should match, in order for the EA  
15 to match the ERAT entry, by checking the PSI fields for each ERAT  
entry;  
      upon determining which ranges should match, means for  
determining if there is a match by comparing the appropriate  
ranges of the EA and the ERAT entry;  
20        upon determining the EA matches an ERAT entry, means for  
looking up a corresponding data array address (DAA) in a data  
array (DA) table;  
      means for using the PSI fields to determine which ranges  
from the EA and which ranges from the DAA should be used for the  
25 RA; and  
      means for outputting the appropriate ranges from the EA and  
DAA as the RA.

- 30        18. The apparatus of Claim 15, wherein the EA is written to  
the ERAT table, and the apparatus further comprises means for  
determining whether the EA is translation-disabled.

19. The apparatus of Claim 18 wherein, upon determining the EA is not translation-disabled, the apparatus further comprises:

means for determining the page size of the entry to be written;

5 upon determining the page size, means for setting the appropriate PSI fields for the entry to indicate the page size;

means for setting the EA field in the entry to the value of the EA provided; and

means for writing the entry.

10 20. The apparatus of Claim 18 wherein, upon determining the EA is translation-disabled, the apparatus further comprises:

means for determining whether the EA matches an existing ERAT entry; and

15 upon determining the EA matches an existing ERAT entry, means for using the existing ERAT entry for the EA instead of writing a new entry.

22. The apparatus of Claim 15, wherein the ERAT entry is  
20 invalidated.

23. The apparatus of Claim 22, further comprising:

means for dividing the EA into ranges based upon how many page sizes are supported;

25 means for comparing the EA to each entry in the ERAT;

means for determining which EA ranges should match in order for the EA to match the ERAT entry by checking the PSI fields for each ERAT entry; and

upon determining the EA matches an ERAT entry, means for  
30 setting an invalid indicator field in the ERAT entry.

24. A computer program product for efficiently storing an effective address (EA) in an effective to real address

translation (ERAT) table supporting multiple page sizes, the computer program product having a medium with a computer program embodied thereon, the computer program comprising:

computer program code for adding page size indicator (PSI) fields, based on the number of unique page sizes supported, to each ERAT entry;

computer program code for storing an EA using one ERAT entry; and

computer program code for setting the PSI fields of the ERAT entry to indicate the page size.

25. The computer program product of Claim 24, wherein the EA is translated to a real address (RA) using the ERAT table.

26. The computer program product of Claim 25, further comprising:

computer program code for dividing the EA into ranges, based on the number of page sizes supported;

computer program code for comparing the EA to each entry in the ERAT;

computer program code for determining whether the EA is translation-disabled;

upon determining the EA is translation-disabled, computer program code for outputting the EA as the RA;

upon determining the EA is not translation-disabled, computer program code for determining which EA ranges should match, in order for the EA to match the ERAT entry, by checking the PSI fields for each ERAT entry;

upon determining which ranges should match, computer program code for determining if there is a match by comparing the appropriate ranges of the EA and the ERAT entry;

upon determining the EA matches an ERAT entry, computer program code for looking up a corresponding data array address (DAA) in a data array (DA) table;

5 computer program code for using the PSI fields to determine which ranges from the EA and which ranges from the DAA should be used for the RA; and

computer program code for outputting the appropriate ranges from the EA and DAA as the RA.

10 27. The computer program product of Claim 24, wherein the EA is written to the ERAT entry, and further comprises computer program code for determining whether the EA is translation-disabled.

15 28. The computer program product of Claim 27, wherein upon determining the EA is not translation-disabled, the computer program product further comprises:

computer program code for determining the page size of the entry to be written;

20 upon determining the page size, computer program code for setting the appropriate PSI fields for the entry to indicate the page size;

computer program code for setting the EA field in the entry to the value of the EA provided; and

25 computer program code for writing the entry.

29. The computer program product of Claim 27, wherein upon determining the EA is translation-disabled, the computer program product further comprising:

30 computer program code for determining whether the EA matches an existing ERAT entry; and

upon determining the EA matches an existing ERAT entry, computer program code for using the existing ERAT entry.

30. The computer program product of Claim 24, wherein the ERAT entry is invalidated.

5        31. The computer program product of Claim 30, further comprising:

      computer program code for dividing the EA into ranges based upon how many page sizes are supported;

10        computer program code for comparing the EA to each entry in the ERAT;

      computer program code for determining which EA ranges should match in order for the EA to match the ERAT entry by checking the PSI fields for each ERAT entry; and

15        upon determining the EA matches an ERAT entry, computer program code for setting an invalid indicator field in the ERAT entry.